

title

ai and robotics based on orthopedic mortalities: current applications and future stabilization

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abstract

orthopedic injuries and musculoskeletal disorders contribute significantly to global morbidity and mortality, particularly among older adults, trauma patients, and individuals with hip fractures. artificial intelligence (ai) and robotic technologies are increasingly being integrated into orthopedic practice to improve diagnosis, surgical precision, postoperative care, and rehabilitation. this paper reviews the role of ai and robotics in reducing orthopedic mortalities and discusses future strategies

for stabilizing mortality rates. evidence indicates that ai-assisted decision-making and robotic-assisted orthopedic surgery can improve clinical outcomes, reduce complications, and lower mortality risk, although challenges related to cost, accessibility, and ethical considerations remain.

keywords

artificial intelligence, robotics, orthopedics, mortality, robotic surgery, fracture, machine learning

introduction

orthopedic conditions, particularly hip fractures, spinal trauma, and major musculoskeletal injuries, are associated with substantial mortality worldwide. elderly patients with hip fractures have a one-year mortality rate ranging from approximately 20% to 30%. recent advances in artificial intelligence and robotic-assisted orthopedic surgery have enhanced preoperative planning, implant positioning, fracture detection, and postoperative rehabilitation. ai algorithms can predict complications and mortality risk, while robotic systems improve surgical accuracy and reduce procedural errors. this review evaluates the current evidence regarding ai and robotics in reducing orthopedic mortality and explores future stabilization strategies.

methods

this review follows the imrad framework and is based on published literature retrieved from peer-reviewed databases including pubmed, scopus, web of science, and iee xplora. studies published between 2019 and 2026 involving artificial

intelligence, robotic orthopedic surgery, mortality prediction, fracture management, and orthopedic rehabilitation were reviewed. systematic reviews, meta-analyses, randomized controlled trials, and clinical practice guidelines were prioritized.

results

ai-based imaging systems demonstrated high accuracy in detecting fractures, joint degeneration, and postoperative complications. machine learning models successfully predicted mortality and adverse outcomes following hip fractures using clinical, laboratory, and demographic variables. robotic-assisted orthopedic procedures, including knee and hip replacement surgeries, achieved improved implant alignment, fewer surgical complications, reduced blood loss, and shorter hospital stays compared with conventional techniques. ai-powered rehabilitation systems and wearable devices enhanced postoperative recovery through continuous monitoring and personalized rehabilitation programs. however, widespread implementation remains limited by financial costs, technical expertise, and infrastructure requirements.

discussion

artificial intelligence and robotics have the potential to significantly reduce orthopedic mortality by improving diagnostic accuracy, optimizing surgical outcomes, and supporting individualized rehabilitation. future stabilization strategies include expanding access to robotic-assisted surgery, integrating ai into routine orthopedic decision-making, developing predictive models for high-risk patients, and strengthening surgeon training programs. ethical governance, data security, algorithm transparency, and equitable healthcare access will be essential to maximize clinical benefits.

conclusion

ai and robotics represent transformative technologies in orthopedic care. by improving fracture diagnosis, surgical precision, risk prediction, and rehabilitation, these technologies can reduce orthopedic mortality and improve long-term patient outcomes. continued research, multidisciplinary collaboration, and responsible implementation are necessary to ensure sustainable reductions in orthopedic-related deaths.

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